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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/775,106

02/01/2001

Gerard A. Mourou

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06/21/2006

EXAMINER

EVANS, GEOFFREY S

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ART UNIT

PAPER NUMBER

1725

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Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/775,106

Applicant(s)

MOUROU ET AL.

Examiner

Geoffrey S. Evans

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 14 September 2005.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 46-105 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 46-105 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>20050914, 20051024</u> . | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

1. The Request for Continued Examination (RCE) on 14 September 2005 has been received and prosecution is reopened.
2. The reissue oath/declaration filed with this application is defective (see 37 CFR 1.175 and MPEP § 1414) because of the following: The reissue oath/declaration filed with this application is defective because it fails to identify at least one error which is relied upon to support the reissue application. See 37 CFR 1.175(a)(1) and MPEP Section 1414. Applicant has submitted copies of the reissue declaration from the parent reissue application. This declaration is no longer applicable to the errors that are being corrected in this divisional. While the specific errors listed were corrected in the divisional, other errors are now being addressed in this application. Applicant needs to specify the errors that are now being corrected. In accordance with 37 CFR 1.175(b)(1), a supplemental reissue oath/declaration under 37 CFR 1.175(b)(1) must be received before this reissue application can be allowed.
3. This application is objected to under 37 CFR 1.172(a) as lacking the written consent of all assignees owning an undivided interest in the patent. The consent of the assignee must be in compliance with 37 CFR 1.172. See MPEP § 1410.01.

A proper assent of the assignee in compliance with 37 CFR 1.172 and 3.73 is required in reply to this Office action.

When this divisional was filed applicant sent in copies of the consent of the assignee and the reissue declaration. This is not acceptable. MPEP Section 1451 states

"Whenever a divisional reissue application is filed with a copy of the oath/declaration and assignee consent from the parent reissue application, the copy of the assignee consent from the parent reissue should not be accepted. The copy of the consent from the parent reissue application does not indicate that the assignee has consented to the addition of the new invention of the divisional reissue application to the original patent."

4. Claim 52 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. There is no support in U.S. Patent No. 5,656,186 that the material being machined can be a semiconductor as recited in claim 52.

Applicant cannot successfully argue that Applicant by contemplating the genus of all materials for this process entitles Applicant to now claim the species of semiconductors for use in the process. See Ex Parte Klager, 132 USPQ 206,207 '... as a matter of law, an applicant cannot include and claim a specific thing not originally described, merely because it comes within the scope of the genus before disclosed.'

5. Claims 54,56, 59-61,66,67, 78,79,80-100,101-105 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. In claims 56 there is no disclosure of

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"focusing the beam beneath the surface of the material", but that is the only method disclosed in U.S. Patent No. 5,656,186 for directing the beam "in the material" or "beneath the surface of the material" therefore this limitation must be present in any recitation of this subject matter; otherwise new matter is present. Claims 59-61 are rejected solely because they depend upon claim 56. Claims 87-90 are rejected solely because they depend upon claim 86. Claims 92-95 are rejected solely because they depend upon claim 91. Claims 97-100 are rejected solely because they depend upon claim 91. Claims 102-105 are rejected solely because they depend upon claim 91. Respectfully suggest amending claims to recite the necessary step of focusing the beam to a point beneath the surface to obviate this rejection.

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000.

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Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

7. Claims 46,47,48,49,50, 51, 52, 55, 57, 58,62,63 are rejected under 35 U.S.C. 102(b) as being anticipated by Sherman et al. in the article "Transient response of metals to ultrashort pulse excitation". Sherman et al. discloses a laser induced breakdown (LIB) of copper and molybdenum (a non-biologic material)(see page 1115, column 1, line 58 –column 2, line 2 and page 116, paragraph 1). Figures 1(a)-(b) of Sherman et al. specifically depicts the change in slope, i.e. no longer proportional to the square root of the pulse width. Page 116, column 1 of Sherman et al. discloses that there are two distinct regions, the short pulse region and the long pulse region. The short pulse region, less than 500 picoseconds, is disclosed as having a damage threshold that is independent of pulse duration. The long pulse regions, greater than 1 nanosecond, are described as having a damage threshold that scales with  $T^{1/2}$  (page 1116, column 1, paragraph 1). Additionally, Sherman discloses using pulse durations of 2.5 picoseconds (2500 fs) with pulse energy of 1 mJ (Page 115, column 1, last full paragraph). Sherman et al. specifically states that the short pulse region is independent of the pulse duration and has a higher damage threshold than anticipated and shows use of pulses below the characteristic pulse width (Figure 1 and page 1116, column 1, paragraph 1). Sherman discloses the use of a laser operating in the claimed pulse width region, i.e. at or below the fluence breakdown threshold for the particular material being operated on within the claimed ranges (Figure 1 and page 1116, column 1, paragraph

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1). The laser pulses of Sherman et al. must be directed at the workpiece for the workpiece to absorb the energy from the laser pulses and to successfully ablate material. With respect to claim 47, Sherman et al. discloses using a CO<sub>2</sub> laser with a wavelength of 9.3 microns and a resolution of 1 micron (see page 1115, column 1, paragraph 6 to column 2, paragraph 2). The resolution has a maximum dimension of 1 micron is less than the size of the wavelength of the laser beam (9.3 microns); the limitations of claim 47 are met. Since Sherman et al. and the instant application are both performing laser induced breakdown processes with similar operating parameters, it is inherent that the breakdown disclosed by Sherman et al. includes changes caused by one or more of ionization, free electron multiplication, dielectric breakdown, plasma formation, and vaporization.

8. Claims 46, 48, 49, 50, 51/46, 51/48, 51/49, 51/50, 55/46, 55/48, 55/49, 55/50, 57/46, 57/48, 57/49, 57/50, 58/46, 58/48, 58/49, 58/50, 62/55/46, 62/55/48, 62/55/49, 62/55/50, 63/46, 63/48, 63/49, 63/50, 68/46, 68/48, 68/49, 68/50, 70/46, 70/48, 70/49, 70/50, 71/46, 71/48, 71/49, 71/50, 73/46, 73/48, 73/49, 73/50, and 78 are rejected under 35 U.S.C. 102(b) as being anticipated by Schwab et al. in the article "Femtosecond-Excimer Laser Patterning of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Films". Schwab et al. discloses laser ablation of a non-biologic material (a superconductor) with 500 femtosecond laser pulses with a fluence of 0.2 Joules per square centimeter at the workpiece surface. Since there is no discernible heat effected zone (see figure 2), inherently the wavelength of the laser pulses must be at or equal to the pulse width at which laser induced breakdown becomes essentially accurate at a corresponding fluence. Since Schwab et al. and the

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instant application are both performing laser induced breakdown processes with similar operating parameters, it is inherent that the breakdown disclosed by Sherman et al. includes changes caused by one or more of ionization, free electron multiplication, dielectric breakdown, plasma formation, and vaporization.

9. Claims 46,48-50,51/46,51/48,51/49, 51/50,52/46,52/48,52/49, 52/50, 55/46, 55/48, 55/49,55/50,57/46,57/48,57/49,57/50,58/57/46,58/57/48,58/57/49,58/57/50, 62/46,62/48,62/49,62/50,63/46,63/48,63/49,63/50, 65/46,65/48,65/49,65/50, 68/46,68/48,68/49,68/50,69/46,69/48,69/49,69/50,71/46,71/48,71/49,71/50,72/46,72/50, 73/46,73/48,73/49,73/50, and 78 are rejected under 35 U.S.C. 102(e) as being anticipated by Alexander in U.S. Patent No. 6,489,589 B1. Alexander discloses (see column 9, line 63 to column 10, line 38) laser machining stainless steel, gold, copper, iron, nickel, titanium, silicon, and diamond, which is far less than a pulse width of 10 picoseconds which is disclosed by the instant application as the point at which machining is essentially accurate with these materials. Since Alexander discloses a pulse width shorter than 10 picoseconds inherently under Applicant's discovered law of nature (the log-log relationship between the fluence threshold at which breakdown occurs versus laser pulse width, the relationship exhibiting a distinct change in slope with respect to decreasing pulse width to a nearly constant value) the laser pulse ablation of Alexander must also be subject to the same law of nature. See EMI Group North America v. Cypress Semiconductor Corp., 60 USPQ 1423,1430 (CAFC 2001), which states "Recitation of a law of nature does not distinguish a claim from prior art. Funk Bros. Seed Co. V. Kalo Inoculatn Co., 333 U.S. 127,130 (1948) ("[M]anifestations



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of laws of nature {are} free to all men and reserved exclusively to none. He who discovers a hitherto unknown phenomenon of nature has no claim to monopoly of it which the law recognizes.”). Similarly Alexander’s pulse width must be below the pulse width at which the laser induced breakdown becomes essentially accurate and the point at which the size of the feature is not limited by thermal diffusion and the pulse width of Alexander is sufficiently short that the affected area is substantially determined by solely by the beam shape and fluence in relation to the threshold for laser induced breakdown. Regarding claims 65/46,65/48,65/49,65/50, Alexander discloses in column 10,lines13-14 “ ... the laser beam may be oscillated to cover a wider area.” which is considered to mean scanning of the laser beam to the workpiece.

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

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consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

12. Claims 47,51/47,52/47,55/47,56,57/47,58/57/47, 59,60,61,62/47,63/47, 65/47,66, 68/47,69/47,70/47,71/47,72/47,73/47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alexander in U.S. Patent No. 6,489,589 B1 in view of Lai in U.S. Patent No. 5,984,916. Lai as shown in figure 5 teaches creating an interaction zone that is smaller than the wavelength of the laser beam beneath the surface of the workpiece. It would have been obvious to adapt Alexander in view of Lai to provide this to decrease the size of the part of the material that has material properties change.

13. Claims 64/46,64/48,64/49 and 64/50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alexander in U.S. Patent No. 6,489,589 B1 in view of Mourou et al. in U.S. Patent No. 5,235,606. Mourou et al. (606) teaches generating a short optical pulse by stretching the pulse in time, amplifying the pulse, and recompressing the amplified pulse. It would have been obvious to adapt Alexander in view of Mourou et al. to provide this to create a short high peak power pulse.

14. Claim 64/47 is rejected under 35 U.S.C. 103(a) as being unpatentable over Alexander in view of Lai as applied to claim 47 above, and further in view of Mourou et al. in U.S. Patent No. 5,235,606. Mourou et al. (606) teaches generating a short optical pulse by stretching the pulse in time, amplifying the pulse, and recompressing the amplified pulse. It would have been obvious to adapt Alexander in view of Lai and Mourou et al. to provide this to create a short high peak power pulse.

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15. Claims 53/52/46, 53/52/48, 53/52/49, 53/52/50, 54/53/52/46, 54/53/52/48, 54/53/52/49, 54/53/52/50, 79, and 80 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alexander in view of Wojnarowski et al. in U.S. Patent No. 5,104,480.

Wojnarowski et al. teaches laser machining gold(see column 7,line 19) above a substrate of glass to (see column 6,line 64) to create a conductive pattern for an integrated circuit. It would have been obvious to adapt Alexander in view of Wojnarowski et al. to provide this to create an integrated circuit on the substrate.

16. Claims 53/52/47,54/53/52/47,68/47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Alexander in view of Lai as applied to claim 47 above, and further in view of Wojnarowski et al. in U.S. Patent No. 5,104,480. Wojnarowski et al. teaches laser machining gold (see column 7, line 19) above a substrate of glass to (see column 6,line 64) to create a conductive pattern for an integrated circuit. It would have been obvious to adapt Alexander in view of Lai and Wojnarowski et al. to provide this to create an integrated circuit on the substrate.

17. Claims 67,74-77,81-105 contain subject matter allowable over the art rejection, but are rejected as being based upon a defective reissue declaration under 35 U.S.C. 251 as stated in the second paragraph of this office action.

18. Applicant's arguments filed 14 September 2005 have been fully considered but they are not persuasive. While the specification discloses many ways of laser ablation at the surface by having the fluence exceed the breakdown threshold fluence, the instant specification only discloses machining "in the material" or "beneath the surface of the material" by using a focused laser beam. The declaration of John Nees received

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14 September 2005 has been carefully considered. The declaration of John Nees is persuasive regarding the Ihlemann et al. reference. In particular John Nees argument that in Ihlemann in figure 1 the performance curve of the 500 femtosecond pulses and 22 nanosecond pulses coincide (see paragraph 17 of the declaration) is persuasive.


However the declaration of John Nees is not sufficient to overcome the Alexander reference. In comparing the Alexander reference with the instant invention, John Nees conducted experiments using a pulse energy of 50 millijoules (from column 9, line 37 of Alexander). However Alexander discloses in column 10, line 3 that the exemplary energy level for laser machining is a much lower level of 10 to 20 microjoules.

Furthermore John Nees in his experiment uses glass as the workpiece (see paragraph 24 of the declaration), while Alexander never discloses using glass as the workpiece. Instead Alexander laser machines stainless steel, gold, copper, iron, nickel, titanium, silicon, and diamond (see column 9, line 65 to column 10, line 4).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Geoffrey S Evans whose telephone number is (571)-272-1174. The examiner can normally be reached on Mon-Fri 6:30AM to 4:00 PM, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Dunn can be reached on (571)-272-1171. The fax phone number for the organization where this application or proceeding is assigned is (703)-872-9306.

GSE

  
Geoffrey S. Evans  
Primary Examiner  
Group 1700